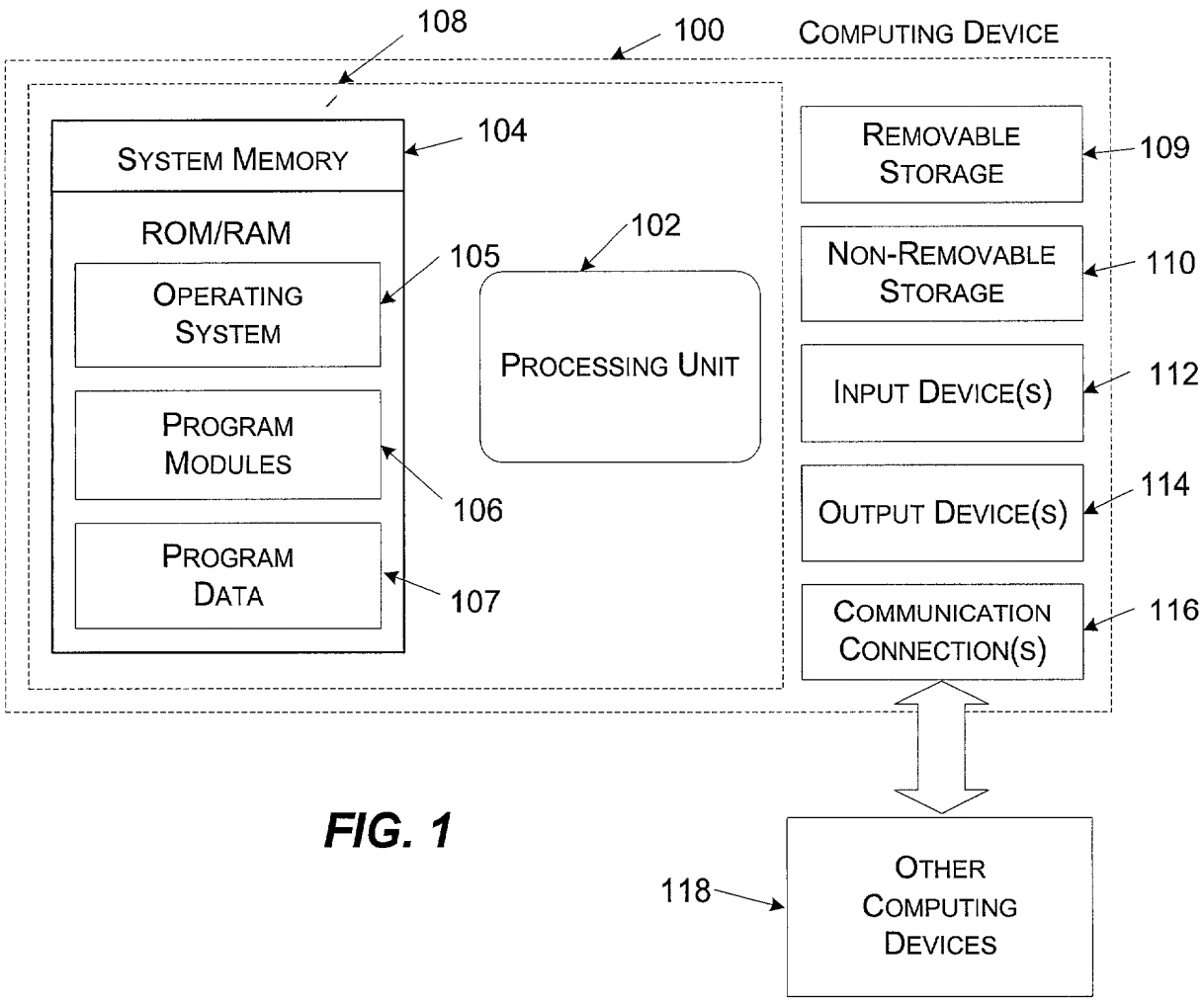
108
100
COMPUTING DEVICE
SYSTEM MEMORY
104
ROM/RAM
105
OPERATING SYSTEM
PROGRAM MODULES
106
PROGRAM DATA
107
102
PROCESSING UNIT
REMOVABLE STORAGE
109
NON-REMOVABLE STORAGE
110
INPUT DEVICE(S)
112
OUTPUT DEVICE(S)
114
COMMUNICATION CONNECTION(S)
116
118
OTHER COMPUTING DEVICES

FIG. 1

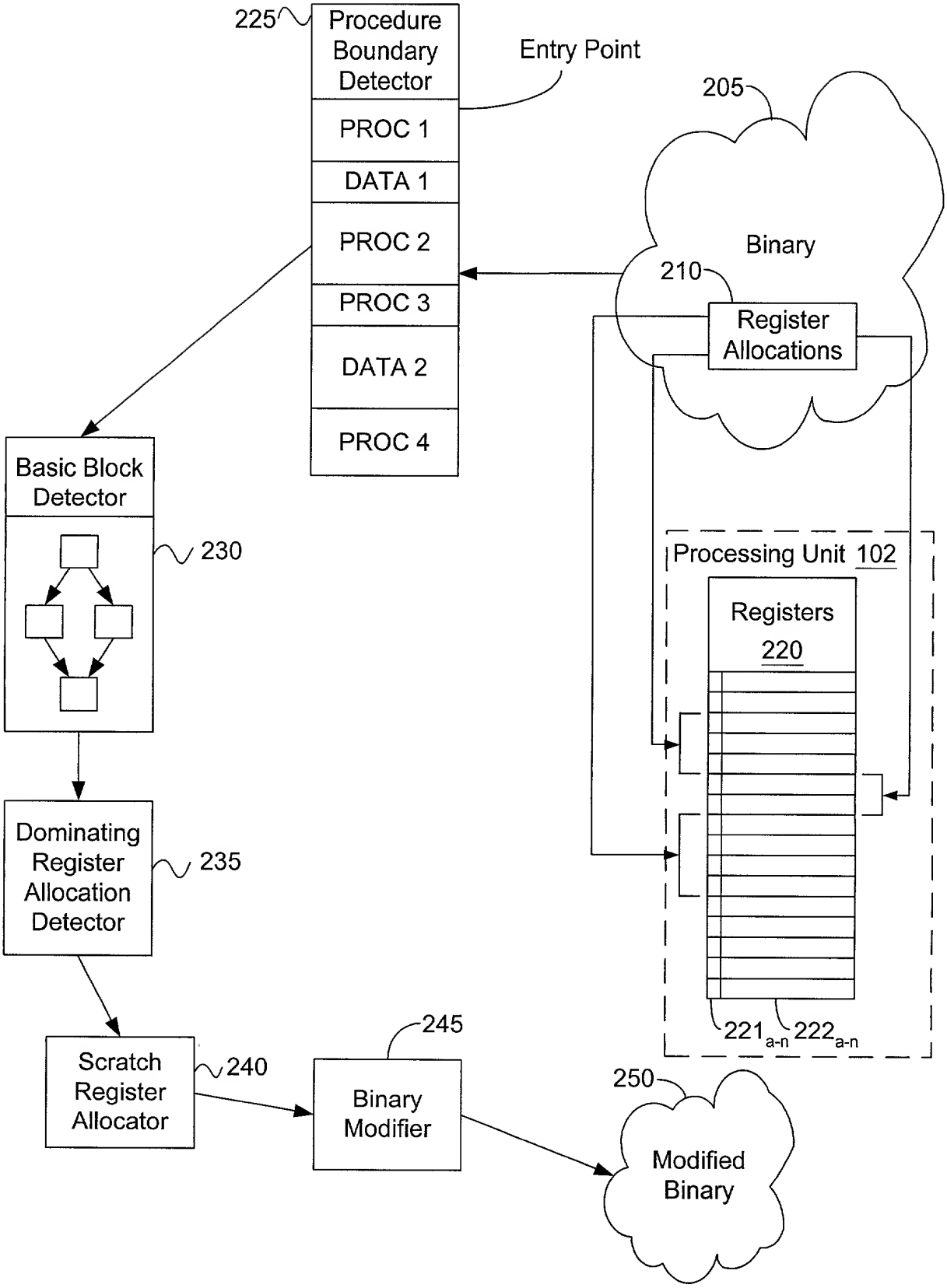
225
Procedure Boundary Detector
Entry Point
PROC 1
DATA 1
PROC 2
PROC 3
DATA 2
PROC 4
205
Binary
210
Register Allocations
Basic Block Detector
230
Processing Unit 102
Registers 220
Dominating Register Allocation Detector
235
Scratch Register Allocator
240
245
Binary Modifier
250
Modified Binary
221a-n
222a-n

FIG. 2

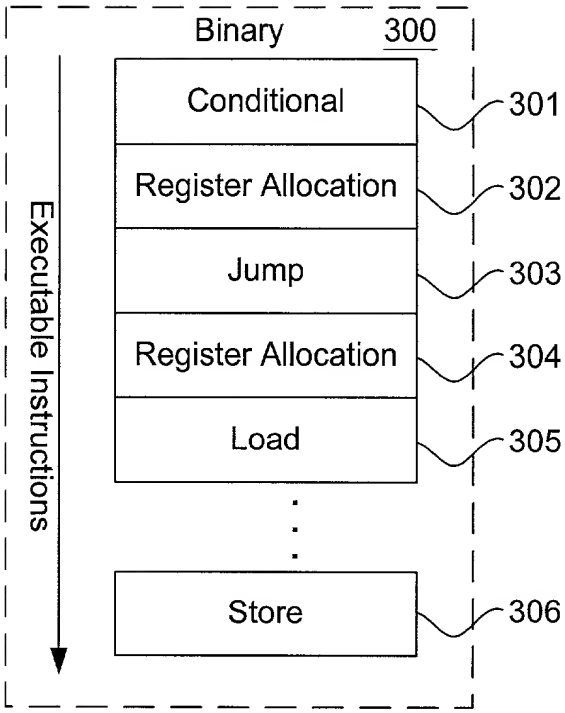
Binary
300
Executable Instructions
Conditional
301
Register Allocation
302
Jump
303
Register Allocation
304
Load
305
Store
306

FIG. 3

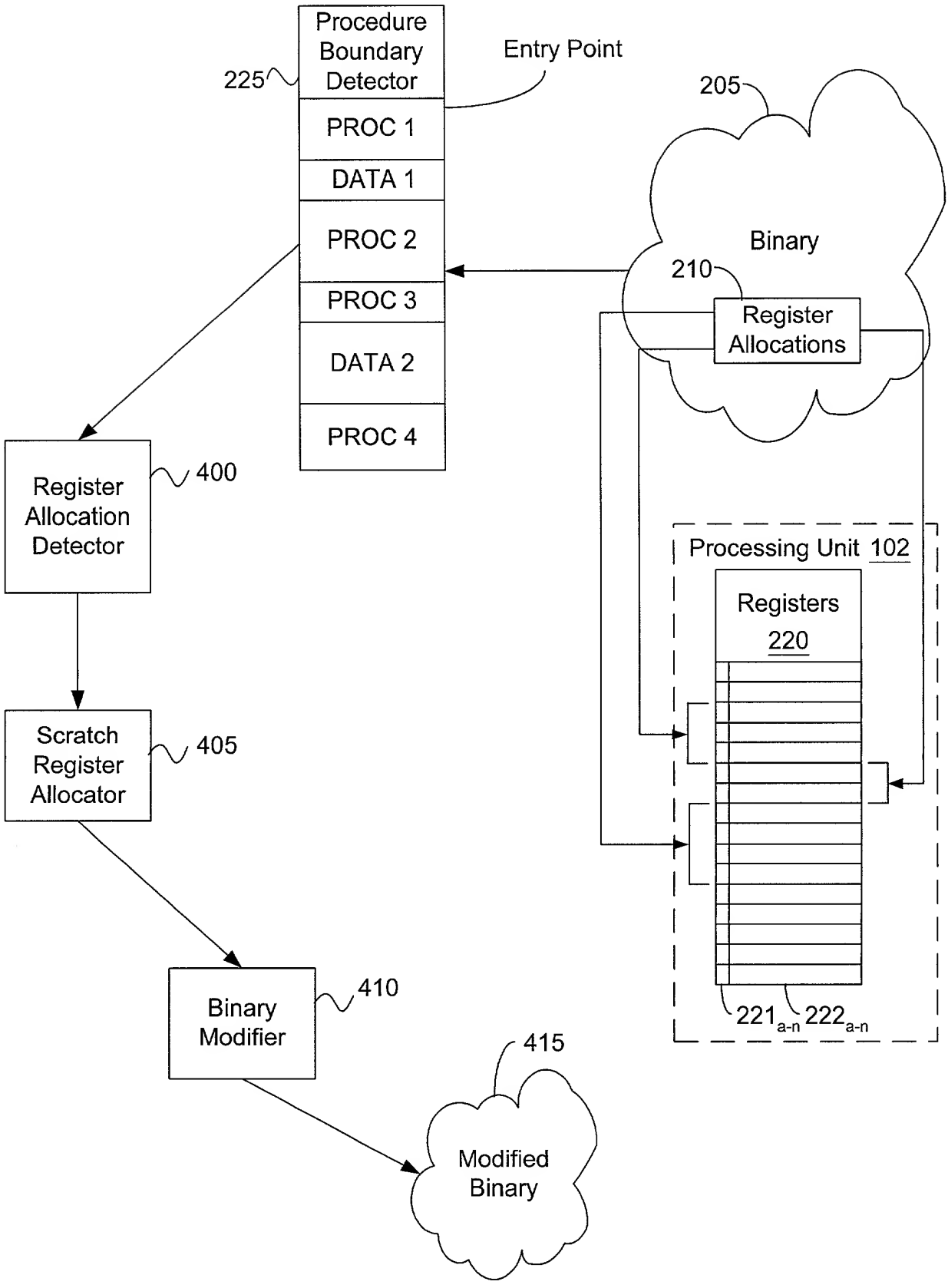
Procedure Boundary Detector
225
Entry Point
PROC 1
DATA 1
PROC 2
PROC 3
DATA 2
PROC 4
205
Binary
210
Register Allocations
Register Allocation Detector
400
Scratch Register Allocator
405
Binary Modifier
410
415
Modified Binary
Processing Unit 102
Registers 220
221a-n
222a-n

FIG. 4

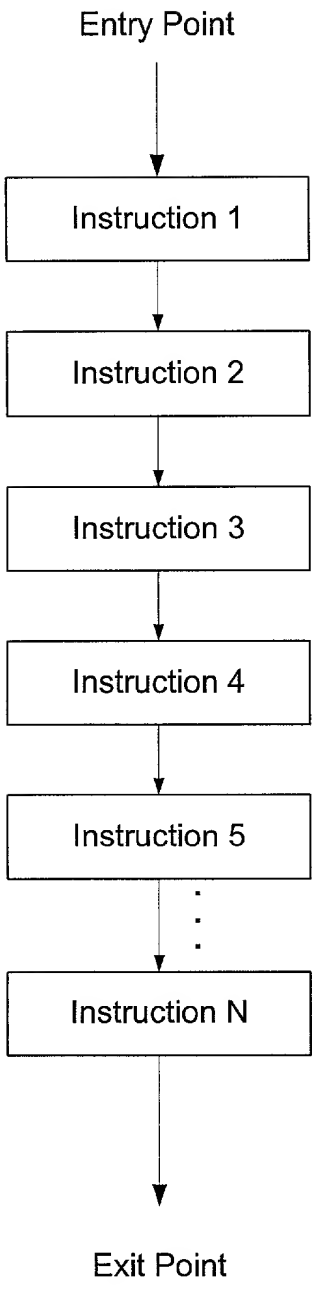
Entry Point
Instruction 1
Instruction 2
Instruction 3
Instruction 4
Instruction 5
Instruction N
Exit Point

FIG. 5A

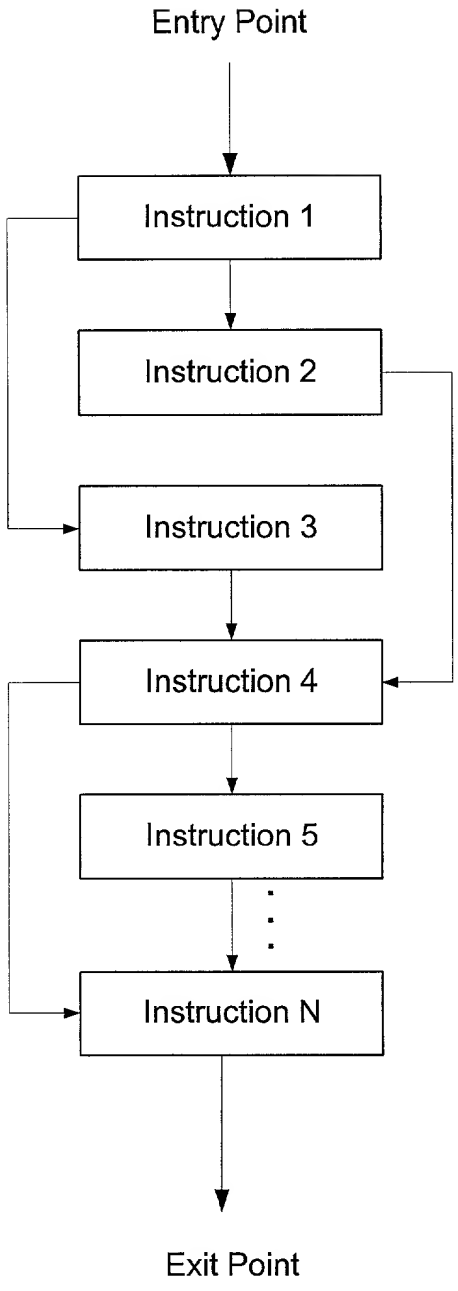
Entry Point
Instruction 1
Instruction 2
Instruction 3
Instruction 4
Instruction 5
Instruction N
Exit Point

FIG. 5B

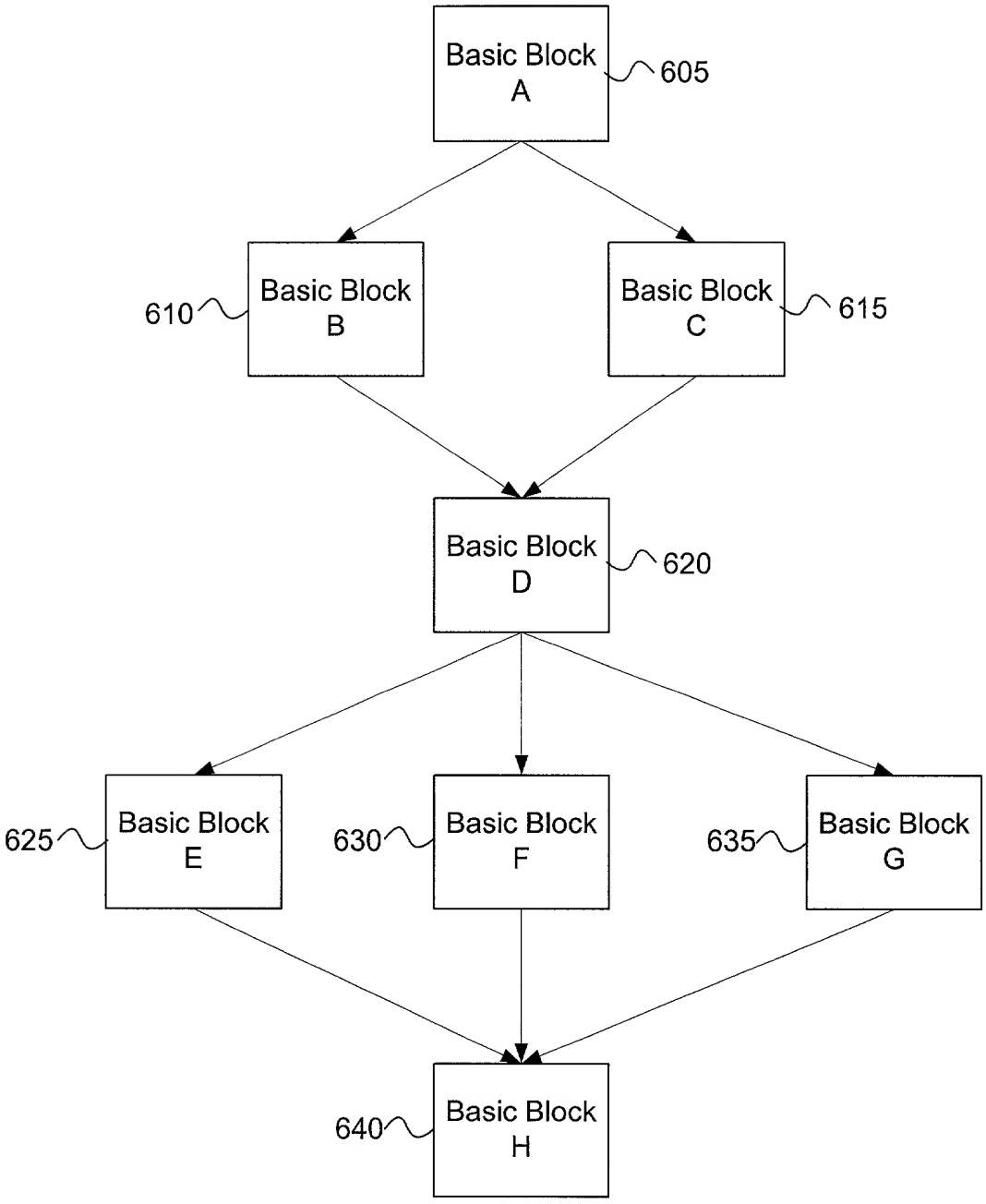
Basic Block A
605
Basic Block B
610
Basic Block C
615
Basic Block D
620
Basic Block E
625
Basic Block F
630
Basic Block G
635
Basic Block H
640

FIG. 6

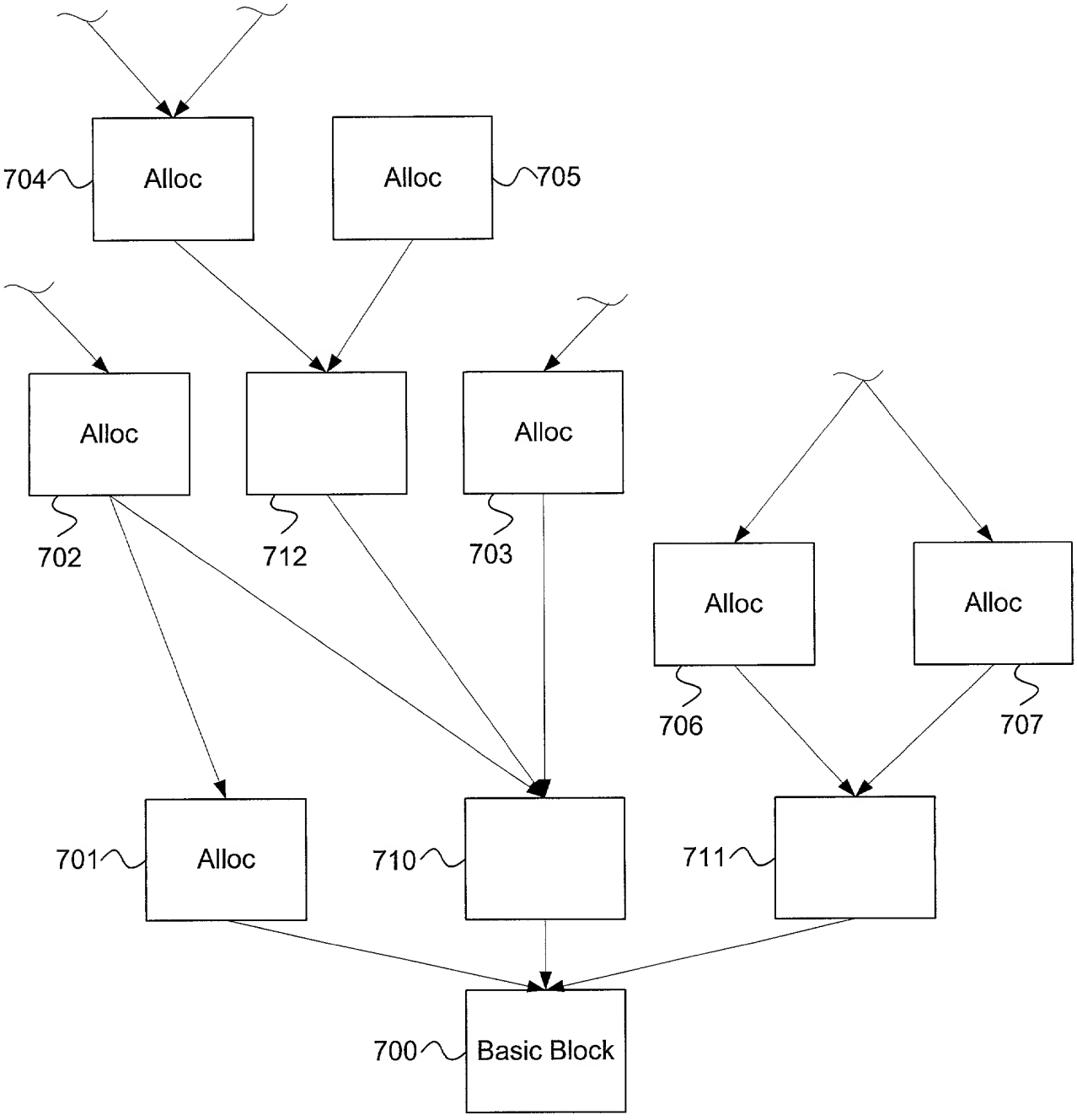
704
Alloc
Alloc
705
Alloc
Alloc
Alloc
702
712
703
Alloc
Alloc
706
707
701
Alloc
710
711
700
Basic Block

FIG. 7

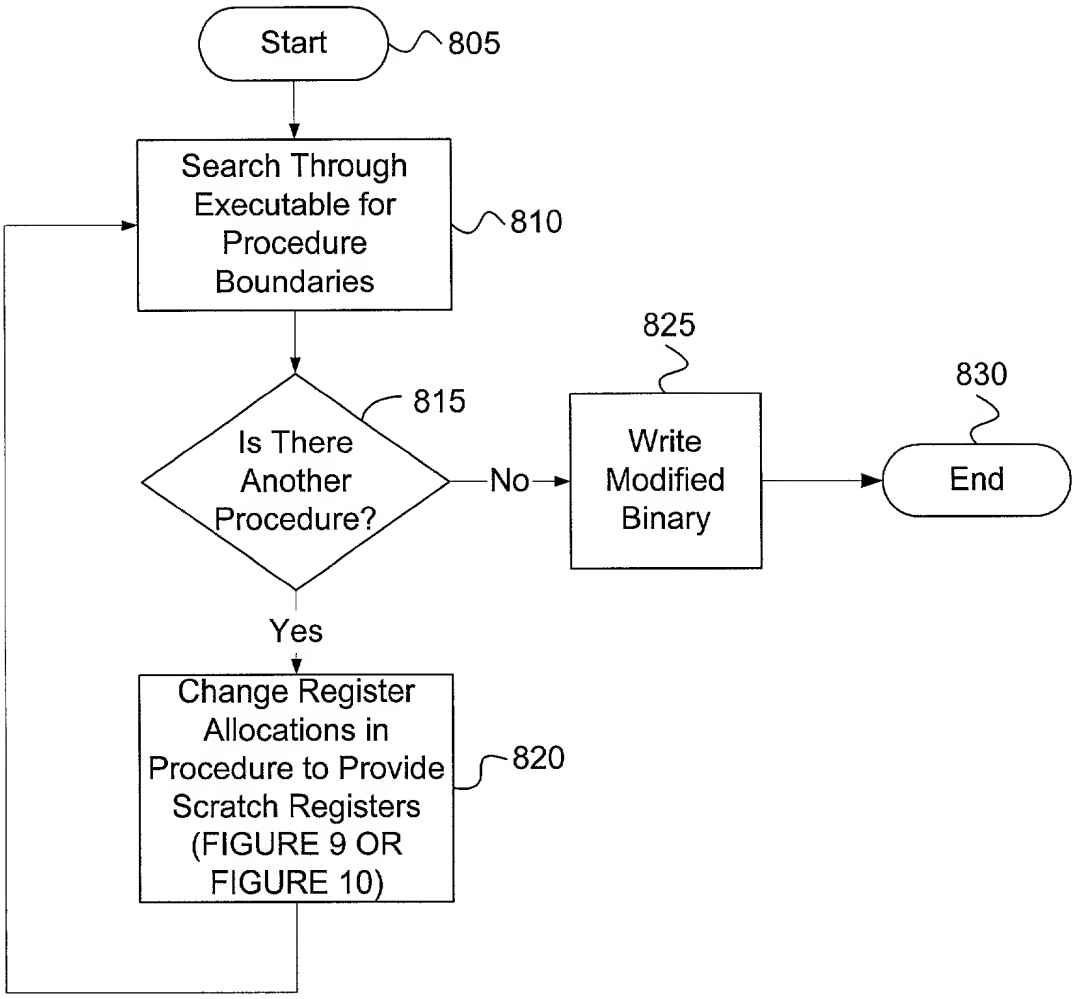
Start
805
Search Through Executable for Procedure Boundaries
810
Is There Another Procedure?
815
No
Write Modified Binary
825
End
830
Yes
Change Register Allocations in Procedure to Provide Scratch Registers (FIGURE 9 OR FIGURE 10)
820

FIG. 8

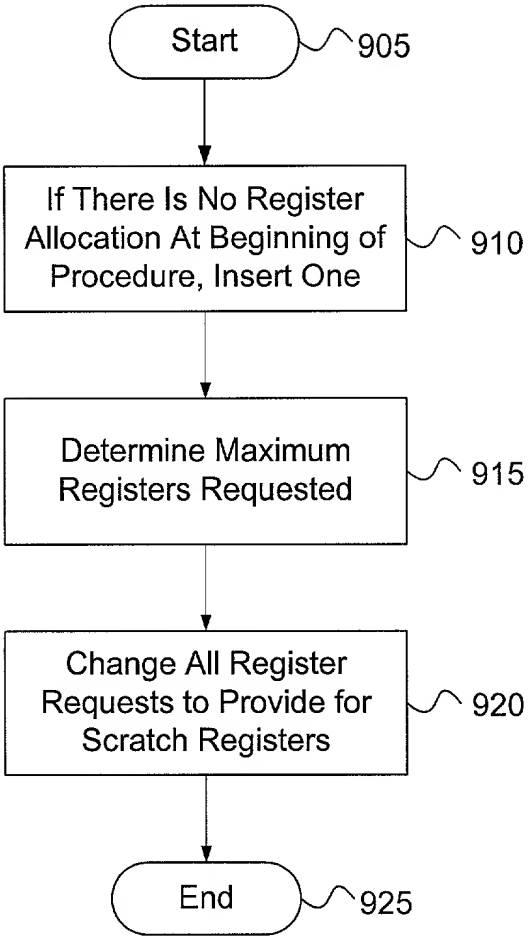
Start
905
If There Is No Register Allocation At Beginning of Procedure, Insert One
910
Determine Maximum Registers Requested
915
Change All Register Requests to Provide for Scratch Registers
920
End
925

FIG. 9

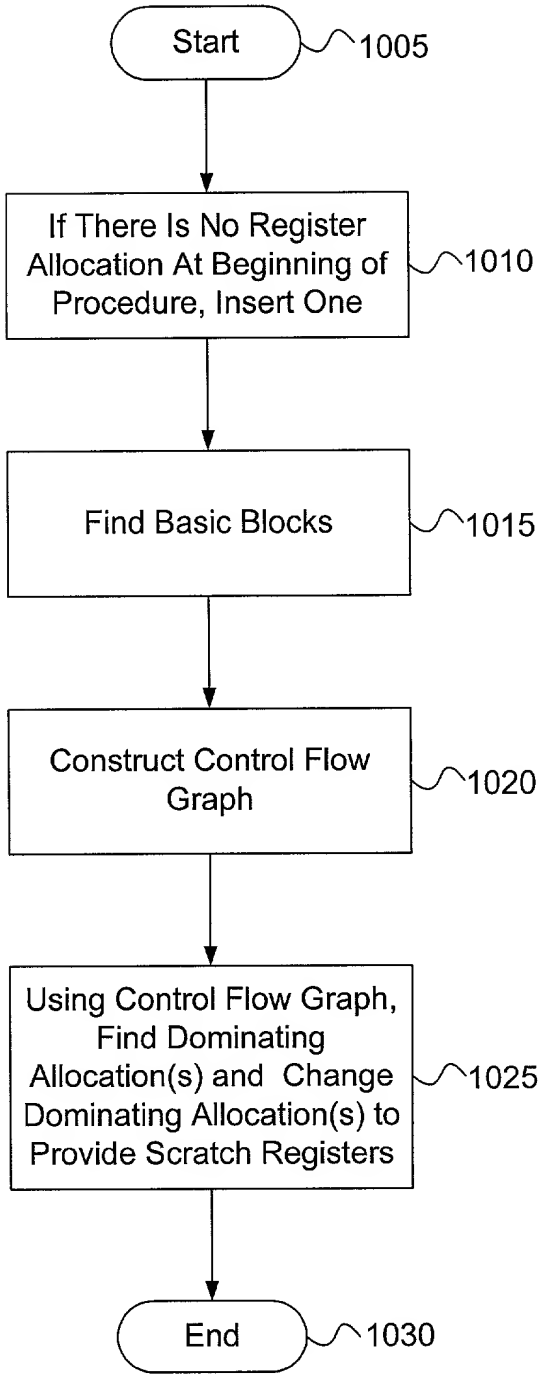
Start
1005
If There Is No Register Allocation At Beginning of Procedure, Insert One
1010
Find Basic Blocks
1015
Construct Control Flow Graph
1020
Using Control Flow Graph, Find Dominating Allocation(s) and Change Dominating Allocation(s) to Provide Scratch Registers
1025
End
1030

FIG. 10